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Fowl Typhoid

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INTRODUCTION

Fowl typhoid is an acute infectious disease of chickens and other domesticated poultry. The disease is widespread in this country, Europe, Africa, and South America. It was first recognized in this country about 50 years ago. Chickens, turkeys, and guinea fowl are susceptible; but ducks, geese, and pigeons are reported to be resistant. Some wild fowl also are susceptible.

During the early days when poultry raising was confined to small farm flocks, fowl typhoid was not a serious economic problem as the losses were controlled by culling and replacement. Since the advent of mass poultry raising, particularly in some broiler-raising areas, losses from fowl typhoid have become alarming, not only in the crowded broiler houses but also on the range and in the breeder laying houses. The practice of culling out the sick birds or pens and cleaning up the premises is no longer adequate to control losses.

Fowl typhoid has greatly increased in frequency, virulence, and extent along the eastern seaboard during the last decade so that is now one of the greatest disease hazards to profitable poultry raising in this area. Fowls of all ages are affected, from baby chicks to breeding stock, and it occurs with about equal frequency in young or mature stock. Losses range in different outbreaks from an occasional bird especially in old breeding flocks up to 75 percent or more in younger

fowls. Fowl typhoid is seen more frequently in warm weather, most acute outbreaks occurring between April and November along the eastern seaboard.

The disease is caused by a germ known as *Shigella gallinarum*. This organism is destroyed by disinfectants and by sunlight in a short time, but it may retain its viability in moist places in the dark for many days and in the carcasses of birds dead of the disease it is reported to survive for several months.

## SYMPTOMS

Chickens affected with acute fowl typhoid have ruffled feathers and a drowsy appearance (fig. 1). Symptoms more characteristic of this

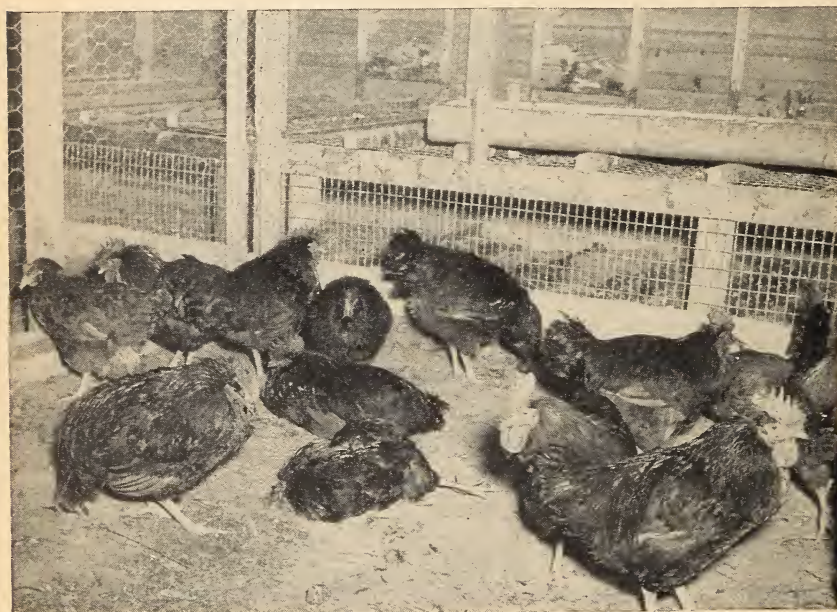


FIGURE 1.—A flock with birds showing symptoms of fowl typhoid. Note the drowsy appearance of several birds and the inclination to stay near the water fountain.

disease are paleness of the head, with a withered drooping comb, and a diarrhea which stains the vent feathers a pale-orange color. Affected birds often stay close to the water fountain trying to quench the unnatural thirst caused by the high temperature characteristic of the acute stage of the disease (fig. 1). Symptoms appear in 3 or 4 days after infection, and in fatal cases death occurs within 1 to 2 weeks after exposure.

## POST MORTEM APPEARANCE

On post mortem examination of an adult fowl that has died of acute typhoid, one usually sees marked enlargement of the liver, spleen and kidneys, but in very acute, rapidly fatal cases little change may be noted in the appearance of these organs. The liver is usually spongy and easily ruptured. The color is lighter than normal and of a mottled



brick-red color with pale streaks. The spleen and kidneys are usually greatly swollen and highly congested with blood. The ovaries are frequently flaccid, highly congested, and often ruptured, when yolk material may be found throughout the abdominal cavity.

In the later stages of an outbreak, when the disease becomes more chronic, one may notice a greenish-bronze color of the liver with sometimes gray pinpoint spots. Gray nodules may sometimes be noted in the heart muscle (fig. 2) and occasionally in the intestines. The fluid in the heart sac is frequently cloudy. In more chronic cases the ova sometimes become caseous and angular resembling pullorum disease.



FIGURE 2.—Heart and liver of a chicken affected with fowl typhoid. Note white nodules on heart and enlarged dark colored liver.

In young chicks the lesions (changes in the organs) are similar to those seen in the acute type of the disease in mature fowls, viz. enlargement and redness of the liver, spleen (fig. 3) and kidneys. In chicks, too, the extent of lesions depends on how long the disease has been in progress. Figure 4 shows the size of organs in a normal chicken.

## DIAGNOSIS

This disease must be differentiated from pullorum disease, fowl cholera, and pullet disease. The causative organisms of fowl typhoid (*Shigella gallinarum*) and pullorum disease (*Salmonella pullorum*) are identical serologically and resemble each other closely when examined



FIGURE 3.—Greatly enlarged liver and spleen (below) of a chicken affected with fowl typhoid. Note size of liver as compared with liver of chick of same age shown in figure 4.

microscopically, but have slightly different cultural characteristics. These two organisms cross-agglutinate, i.e. typhoid antigen (test fluid) is agglutinated by the blood serum of pullorum-infected birds as well as typhoid-infected birds, and pullorum antigen is agglutinated by the serum of typhoid-infected birds as well as pullorum-infected birds.

In young chicks affected with fowl typhoid lung nodules are not seen as often as in pullorum disease.

The greatest differences in symptoms and lesions between these two



diseases are seen in adults. In pullorum disease the disease usually assumes a chronic form with ovarian lesions and only an occasional death, whereas in fowl typhoid the disease is usually acute in the beginning of an outbreak, with high fever, severe depression, and definite lesions. As a result there is high mortality. In the later stages of an outbreak of fowl typhoid prominent lesions may develop, such as gray



FIGURE 4.—Heart and liver of a normal chicken 8 weeks old. Note smaller liver and smooth heart muscles as compared with same organs in figures 2 and 3.

nodules on the heart, infection of the heart sac, a bronze- or chocolate-colored liver, swollen spleen, and flaccid, easily ruptured ova. In pullorum disease the most common lesion is the blighted ovary in which the ova become caseous or cheesy, and angular, pedunculated, and discolored. Infection of the heart sac with cloudy fluid is also common in pullorum disease.

At the beginning of an outbreak of cholera, chickens frequently show no symptoms and few or no lesions, and die suddenly. Later in the outbreak they are greatly depressed and take little or no feed or

water. The head is often dark red, and there may be a gray or greenish diarrhea. The cholera germ may localize (1) in the mucous membranes of the head causing a coryza ("cold"); (2) in the wattles where it may cause pronounced swelling; (3) in the joints causing lameness with swelling, or (4) in the ovary where the ova may become cheesy or ruptured resulting in peritonitis. In cholera the liver is lighter in color than in typhoid, the spleen is seldom much enlarged, and pinpoint hemorrhages are often seen in the intestines, on the heart and gizzard fat, and throughout the abdominal cavity.

In pullet disease the head is congested and bluish. The liver is enlarged with evenly distributed yellow pinpoint spots. The spleen is about normal in size. The abdominal organs are usually congested. The pancreas may appear chalky, and the kidneys may be swollen as in gout. The intestine contains an increased amount of gelatinous mucus. There is usually evidence of general dehydration, and pale fish-like areas may be noticed in the muscles. The disease is seen more often in hot weather, and pullets in good flesh are most frequently affected. No significant bacteria are recovered on bacteriological examination. The outbreak can be controlled by increasing the potash content of the diet.

It should be emphasized, however, that only a tentative diagnosis can be made by observation of symptoms or lesions in fowl typhoid, fowl cholera, or pullorum disease. A positive diagnosis can be made only by recovery of the causative organism from sick birds through laboratory procedures.

## HOW FOWL TYPHOID IS SPREAD

Like many other germ diseases fowl typhoid may be spread by any agent which carries the live organism from sick fowls to susceptible, healthy fowls, and in any healthy-fowl population there are always some individuals which are susceptible. Thus the disease may be spread by man, animals, or equipment if these agents are contaminated by manure, dirt, feed, or water in which the germ can survive. The disease may thereby be carried not only from pen to pen and house to house, but from farm to farm.

The bird sick with typhoid is the most dangerous spreader of the disease because in the acute stage millions of highly virulent germs are being given off rapidly from the mouth and nose as well as through the droppings, thus contaminating the feed, water, and litter. Thus prompt segregation of the sick from the healthy birds is indicated.

The most important perpetuator of fowl typhoid, as in pullorum disease, is probably the carrier bird. In most any outbreak of disease there are some survivors, and in the case of fowl typhoid as well as pullorum disease many of these birds become carriers. The germ localizes in the ova and a variable percentage of eggs laid will be infected, often resulting in a new outbreak when the chicks hatch, or later on.

People, such as the attendant, feed men, chicken buyers, and visitors spread the disease by travelling from house to house or from farm to farm where precautions are not taken to clean and disinfect the footwear and hands between pens. Feed, water, and egg containers, chicken crates, brooders, incubators, and other equipment may be the means of spreading disease if used to service both sick and healthy birds without proper cleaning and disinfection. Putting healthy birds into pens or houses formerly occupied by sick fowls without thorough cleaning and disinfection may be the means of starting a new outbreak.



Animals that may spread the disease by mechanically carrying contaminated material on or in their bodies include rats, buzzards, and other wild birds, dogs, and cats. In carrying disease from house to house the rat is probably the worst animal spreader. On the range the buzzard is thought to be an important factor in spreading the disease from farm to farm as this bird feeds on carrion, and sometimes drinks from range fountains. Flies also may be involved in spreading the disease. Thus it is evident that improper disposal of dead chickens may be one of the greatest factors in spreading and perpetuating fowl typhoid in a community. If dead birds are thrown out without burial or are not picked up from the range they become accessible to buzzards, rats, dogs, cats, raccoons, skunks, and other free-moving carnivorous animals which may carry the disease to disease-free areas.

## CONTROL OF FOWL TYPHOID

When chickens were raised in small flocks on farms fowl typhoid was controlled to a large extent by sanitation and culling, or even by disposing of the entire flock. With mass production of broilers this method, although still practiced, is impractical and ineffective.

Control measures recommended include (1) sanitation, and (2) elimination of carrier birds.

### The Importance of Sanitation

The proper disposal of dead birds is of paramount importance. These should be promptly buried or burned. The maintenance of clean feed and water containers and dry, clean litter is also important in controlling the spread of disease. Feed and water containers should be raised above the floor and guarded by wire grills or reels to prevent birds from entering and contaminating the contents. Water should be changed as often as possible, and the formation of wet spots or puddles around the fountains should be avoided as moisture is favorable to the survival of disease germs.

Birds should not be crowded. The maintenance of too many in one pen leads to rapid soiling of the litter, the accumulation of moisture, and the development of caked litter. All of these factors are favorable for the survival of disease germs. Adequate ventilation and sunlight, important to the health of the birds, also aid in keeping the litter dry. Deep litter should be frequently stirred, and hydrated lime may be added as valuable aids in preventing the spread of typhoid and other filth-borne diseases.

If fowl typhoid is to be controlled on a community-wide basis the following objectionable practices which contribute to the perpetuation and spread of fowl typhoid in the broiler industry should be avoided:

1. Dumping of dead birds on fields or in woods, without burial.
2. Feeding of dead birds to hogs, dogs, cats, or other domestic animals. Partly consumed carcasses left around are fed upon by rats, buzzards, and other scavengers. These animals may then travel to a clean poultry flock and contaminate their feed or water with typhoid germs, and thus start a new outbreak.
3. The practice of chicken buyers bringing dirty crates into a clean yard or house and allowing the manure to fall on the ground is highly dangerous. These crates may have previously contained chickens which were sick with fowl typhoid.

4. Chicken buyers frequently drive directly into the broiler-house yard to load chickens, and the tires may be caked with mud from a yard where fowl typhoid was prevalent. This contaminated mud dropping off into a clean yard might start an outbreak in the next brood of chicks.

5. The dumping of poultry offal from dressing plants onto fields, or into streams is a dangerous practice which might well be a means of spreading fowl typhoid. Streams contaminated with such material may carry typhoid germs a considerable distance to where the water may be drunk by chickens or carried onto clean premises by ducks or geese.

6. Broiler raisers often collect birds dead of disease and bring them all to the feed room where they may be thrown on the floor and cut open, thus contaminating the floor with blood, litter, and droppings which may be carried on the feet of the attendant to other pens which are free of the disease.

7. The return of feed bags to the dealer and re-use of dirty bags may spread disease, since empty feed bags are sometimes used to collect dead birds or may be contaminated by contact with dead birds in the feed room.

8. Vaccinating or testing crews may carry disease from contaminated premises to clean premises if proper care is not exercised to clean and disinfect footwear, change outer clothing, and clean and disinfect instruments and equipment such as bleeding knives or needles, tables, buckets, crates, and other equipment.

9. Dumping egg shells and dead-in-shell embryos in the fields or woods may cause fowl typhoid to be spread through the depredations of wild or domestic animals.

### SUGGESTIONS FOR CONTROL OF AN OUTBREAK IN A BROILER FLOCK

As soon as any symptoms of fowl typhoid are evident the sick birds should be shut off at once from pens in which there is no disease. Travel from pen to pen or from house to house should be kept to a minimum. The attendant should take special precautions to clean and disinfect his footwear, hands, and any utensils which may be carried from pen to pen and the infected pen should be serviced last. In this way the disease may be confined to one or two pens.

Measures which may help to control spread of the disease in the sick pen include the prevention of contamination of the feed and water by sick birds and disinfecting the litter.

The feed and water containers should be so constructed as to prevent the birds from getting into them. Feed should be fed in small quantities and often so as to prevent spilling and ground feeding and to keep fresh feed before the birds. Water should be changed often, or if that is impracticable, a disinfectant, preferably one of the chlorine types, may be added to the water. No grain should be fed on the ground.

The litter may be sprayed with a cresylic or other coal-tar disinfectant to discourage birds from picking at the droppings or spilled feed. Lime may be spread in the room and the litter stirred.

If mortality mounts rapidly in spite of these measures, the birds should be disposed of, and the pen thoroughly cleaned and disinfected before putting in a new lot of chicks. The following cleaning procedure is recommended:

All litter and the top 2 or 3 inches of dirt (if the house is not floored) should be removed.

Walls, ceiling, and ledges should be washed down with a hose. This should be followed by spraying the entire interior of the house with a disinfectant such as a 2 percent lye solution, 3 percent cresylic disinfectant, or other reliable disinfectant. The roosts and nests may be sprayed with carbolineum to kill mites.

Debris should be removed from the yard, and holes should be filled with clean sand or gravel. The action of the sun and wind for 2 or 3 weeks is sufficient to destroy any typhoid germs in the yard but all holes not open to the sun should be closed up to keep chickens out.

All feed and water containers should be cleaned and disinfected. After drying out, the floor, if dirt, may be covered with about 2 inches of clean sand followed by 3 or 4 inches of an absorbent litter, such as sawdust, crushed corncobs, cane fiber, peanut hulls, or peat moss.

In obtaining chicks for replacement an effort should be made to obtain them from healthy and pullorum-clean flocks only.

### CONTROL OF AN OUTBREAK IN THE BREEDING FLOCK

The same sanitary procedures recommended in a broiler outbreak may be applied to the breeding flock. In small breeding flocks fowl typhoid is probably most economically controlled by replacing of the entire flock and cleaning up. In large breeding flocks, or where replacement is not practical, repeated agglutination tests of the survivors to remove carriers are recommended.

Since fowl typhoid, like pullorum disease, may be passed through the egg, the elimination of carrier birds is of prime importance in the control of fowl typhoid.

It would appear that since the serum of typhoid-infected birds cross-agglutinates with pullorum antigen the annual agglutination test made in a pullorum-clean flock would remove all of the typhoid carriers (reactors) as well; but such is not the case, as fowl typhoid sometimes breaks out in pullorum-clean laying flocks. It is necessary, therefore, to make additional agglutination tests to remove all of the typhoid carriers. These tests should be conducted at short (30 to 60 day) intervals with pullorum antigen<sup>1</sup> until it is apparent that all typhoid reactors are removed from the flock. Typhoid carriers may infect not only their progeny through their eggs, but may also infect their susceptible pen mates and start an outbreak when weather conditions, heavy production, dietary deficiencies, or unknown factors which lower resistance become operative. Hens that eat eggs should be removed from the flock, as they may infect themselves and other hens by breaking and consuming typhoid-infected eggs.

No method of immunization against fowl typhoid has yet been found which is sufficiently effective to be recommended.

No satisfactory treatment of fowl typhoid is yet available. Some of the sulfonamid drugs are being tried and some of these may eventually prove useful, particularly for the control of the disease in broiler flocks.

<sup>1</sup>A rapid whole-blood typhoid antigen is being developed but it is still in the experimental stage, and is not available for distribution.



